

# Index Methodology

Bloomberg Galaxy Crypto Index

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## INTRODUCTION

The Bloomberg Galaxy Crypto Index ("Index") is designed to measure the performance of the largest Cryptocurrencies traded in USD. The index is owned and administered by Bloomberg Index Services Limited ("BISL" or "Administrator") and is co-branded with Galaxy Digital Capital Management LP ("Galaxy").

The Index can be accessed on the Bloomberg Terminal® via ticker BGCI Index <GO>.

BISL administers the Index according to four guiding principles:

1. Data Integrity	Pricing Sources are selected for liquidity and reliability and approved for use following risk and suitability assessments. Cryptocurrencies must meet minimum thresholds for daily traded USD-value.
2. Diversified	No single constituent can exceed 30% or contribute below 1% of the market capitalization of the Index.
3. Representative	The Index seeks to provide a proxy for the broader Cryptocurrency market.
4. Continuity	The Index is intended to be responsive to the changing nature of the market in a manner that does not completely reshape the character of the Index from year to year.

## INDEX CONSTRUCTION OVERVIEW

The composition of the Index is reviewed on a regular basis pursuant to the procedures set forth in this methodology by Bloomberg Index Managers operating under the oversight of Bloomberg's Benchmark Oversight Committee ("BOC") and supervision of Bloomberg's Index Operating Subcommittee ("IOS"). Any material deviations or changes from established procedures are subject to review by the IOS. In addition, to the extent practicable, BISL may solicit stakeholder feedback, including by means of the Index Advisory Council ("IAC"). Once approved, the deviation or change is announced publicly and takes effect as soon as practicable.

## SELECTION OF CONSTITUENTS

The Index systematically determines a Cryptocurrency's eligibility in the Index based on the following:

1. Trades in USD
2. Trades on a minimum of two Bloomberg-approved Pricing Sources <sup>1</sup>
3. Minimum 30-day median daily value traded of \$2 million across a minimum of two eligible Pricing Sources
4. Free floating prices (not pegged to the value of any asset, including a currency or physical commodity)
5. Cryptocurrency must meet the above eligibility requirements for three consecutive monthly rebalances
6. Hard Forks are considered under the same criteria as any established cryptocurrency
7. Index is limited to the largest twelve eligible Cryptocurrencies by Market Capitalization

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<sup>1</sup> Approved Cryptocurrency Pricing Sources have, at a minimum, represented to Bloomberg that they have documented compliance programs that include, but are not limited to, Anti-Money Laundering (AML) and Know Your Customer (KYC) policies, and have provided Bloomberg with an organizational and/or ownership chart.

The top twelve Cryptocurrencies are measured by their average Market Capitalization over the last five Index Days up to, and including, the Rebalance Announcement Day. The application of these rules will generate the Constituents of the Index.

## **WEIGHTING SCHEME**

All Constituents are initially weighted by their free-float Market Capitalization based on the Circulating Supply<sup>2</sup>. Subsequently, weight caps and floors are applied to the Constituents to promote diversification and avoid overweighting and underweighting. The maximum weight for any Constituent is 30% (Cap) of the Index's float-adjusted Market Capitalization and the minimum weight is 1% (Floor).

If a Constituent exceeds the Cap, the weight will be reduced to the Cap and the excess weight shall be redistributed across all other Constituents in proportion to their weight. Subsequent to the capping, Constituents contributing less than the Floor will be rounded up with the increase removed from the balance of the Constituents below the 30% Cap proportional to their weights. This process is repeated until none of the Constituents have weights exceeding the Cap or fall short of the Floor.

Weights are calculated using the 11:30:00 ET Bloomberg Crypto Price Fixings ("CFIX") four Index Business Days prior to the end of the month. Once the Cap and Floor weights are applied, any subsequent price changes will move the weights away from their Cap or Floor.

## **RECONSTITUTION AND REBALANCE SCHEDULE**

The Index is reconstituted (changing of Constituents) and rebalanced (changing of Constituent weights) monthly. Index weights and Constituents are calculated and announced four Index Business Days prior to end of month ("Rebalance Announcement Day") and implemented on the first Index Business Day of the next month ("Rebalance Implementation Day"). Cryptocurrencies that meet eligibility criterion for three consecutive monthly rebalances will be added and those that fall short of eligibility requirements for three consecutive monthly rebalances will be removed.

The number of constituents in the Index cannot exceed twelve. In the event that the number of eligible Cryptocurrencies exceeds twelve, only the largest twelve, as ranked by their average Market Capitalization, will be included. Average Market capitalization is defined as the average over the five Index Business Days leading up-to, and including the Rebalance Announcement Day.

No new Constituents will be added or existing Constituents removed from the Index intra-month (see "Stress Events" section for exceptions).

## **CONSTITUENT PRICING**

The Constituent CFIX mid-price is used to derive the end-of-day Index level. CFIX is a simple average of the BGN price for any given Cryptocurrency over a 15 minute window between 11:15:00 and 11:30:00 ET.

A BGN price is calculated and used in the calculation of intraday Index levels. The BGN price is generated with real-time pricing data from multiple Pricing Sources (see "Intraday Index Levels" section).

For a BGN price to be computed for a Cryptocurrency, the Cryptocurrency must be priced by a minimum of two Pricing Sources that have non-zero trading fees. The BGN algorithm calculates the BGN median bid and median ask prices for the Cryptocurrency. The BGN mid-price is the average of the BGN bid and BGN ask prices.

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<sup>2</sup> Circulating Supply sourced from OnChainFX

Data from the Pricing Sources are the executable bid and ask prices - not executed trade prices.

## INDEX DISTRIBUTION

The closing Index level is calculated using the CFIX from 11:30:00 ET and published after review and quality checks. Intraday Index levels will be calculated and published on the Bloomberg Terminal from 13:30:00 ET to 11:30:00 ET (22 hours).

## INDEX CALCULATION

The Index level is calculated using the following formula:

$$Index_t = \frac{\sum_{i=1}^x P_{i,t} \times CS_{i,m} \times CF_{i,m}}{D}$$

Where

$Index_t$  = Index level on day t

$P_{i,t}$  = Intraday BGN price or end of the day CFIX price for Constituent i on day t, expressed in Cryptocurrency per index currency (e.g. Bitcoin per USD)

$CS_{i,m}$  = Circulating Supply of Constituent i in month m of the current year

$CF_{i,m}$  = Cap/Floor factor for a Constituent i in month m of the current year

D = Index Divisor

x = Number of constituents

Indicative intraday level for the Index is published every 15 seconds. This level uses intraday BGN pricing. In the above formula for  $Index_t$ ,  $P_{i,t}$  represents the intraday BGN price used in the calculation of the intraday level.

The base level for the Index was set at 1000 on May 3, 2018.

Cap/Floor factor is calculated as:

$$CF_{i,m} = \frac{W_{i,c}}{W_{i,i}}$$

Where

$W_{i,c}$  = Capped/Floor Weight on rebalance day r

$W_{i,i}$  = Initial Weight on rebalance day r

Initial Divisor is calculated as:

$$D_0 = \frac{\sum_{i=1}^x P_{i,0} \times CS_{i,0} \times CF_{i,0}}{1000}$$

Where

$D_0$  = Divisor on May 3, 2018

$P_{i,0}$  = CFIX price for Constituent i on May 3, 2018, expressed in Cryptocurrency per Index currency (e.g. Bitcoin per USD).

$CS_{i,0}$  = Circulating Supply of Constituent i on May 3, 2018

$CF_{i,0}$  = Cap/Floor factor for Constituent i on May 3, 2018

x = Number of constituents

## DIVISOR ADJUSTMENTS

Changes in the Circulating Supply, addition or deletions of Constituents should not change the level of the Index. If the Index closes at a level of 1000 and after the market close a Constituent is replaced by another Constituent, the Index will still open at the 1000 level. This is accomplished by adjusting the Index divisor. Any changes to the Constituent that alter the total market value of the Index while holdings Constituent prices constant, require a divisor adjustment. The Index divisor is simply a scaled representation of the adjusted market capitalization of the Index.

$$D_{new} = D_{old} * \frac{\sum_{i=1}^x P_{i,t} \times CS_{i,m} \times CF_{i,m}}{\sum_{i=1}^n P_{i,t} \times CS_{i,r} \times CF_{i,r}}$$

Where

$P_{i,t}$  = CFIX for Constituent  $i$  on day  $t$ , expressed in Cryptocurrency per Index currency (e.g. Bitcoin per USD)

$CS_{i,m}$  = Circulating Supply of Constituent  $i$  in month  $m$  of the current year

$CF_{i,m}$  = Cap/Floor factor for a Constituent  $i$  in month  $m$  of the current year

$CS_{i,r}$  = Circulating Supply of Constituent  $i$  in month  $m-1$  of the current year

$CF_{i,r}$  = Cap/Floor factor for a Constituent  $i$  in month  $m-1$  of the current year

$D_{old}$  = Old Index Divisor in month  $m-1$  of current year

$x$  = New number of Constituents in month  $m$

$n$  = Old number of Constituents in month  $m - 1$

## ROUNDING OF INPUT DATA

The following rounding protocols are used for the Index calculation:

- Index divisor is rounded to four decimal places
- Weighting Cap/Floor factors are rounded to twelve decimal places

## DATA PROVIDERS AND DATA EXTRAPOLATION

The Index is rules-based, with its construction designed to consistently produce levels without interpolation or extrapolation of input data. As further discussed below, the Index favors defined data backups and level carry-forwards to interpolation or extrapolation, but the Administrator will update this methodology and its internal procedures should either become necessary.

The goal of producing strict rules-based indices extends to the selection of providers of input data, in that the Administrator does not use contributions of input data, which may be prone to contributor discretion. A contribution of input data is defined as such data not readily available to an administrator or to another person for the purposes of passing to an administrator that is required in connection with the determination of a benchmark, and is provided for that purpose. See article 3(1)(8) of REGULATION (EU) 2016/1011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2016.

All input data, as further described below, is readily available to the market and produced and distributed for a number of non-Index purposes. The Administrator reviews all proposed changes to input data to determine, among other things, whether they are contributors of input data needing applicable controls, including a contributor's code of conduct.

## END-OF-DAY INDEX LEVEL

The official end-of-day Index level is calculated using the Bloomberg Crypto Price Fixings (CFIX) at 11:30:00 ET and rounded to two decimal places.

## INTRADAY INDEX LEVEL

The intraday price levels for the Index are calculated using BGN prices. BGN prices are designed to track indicative and executable bid and ask quotes from a select subset of Cryptocurrencies, which have met selection criteria such as pricing consistency, frequency, and quality. To resist manipulation by sources, (a) at least two executable or indicative price inputs are required, (b) sources are anonymous to users and the sources themselves at each pricing point, and (c) sources change from time-to-time depending on the quality of data they provide. Each source is assigned a quality score based on numerous factors including update frequency and spike frequency. BGN also reduces potential bias in pricing by including quotes from both market makers and market participants. Errors related to intraday levels will not be restated, as real time levels are considered indicative only. Intraday index levels are calculated from 13:30:00 ET to 11:30:00 ET on every Index Business Day.

## INDEX PUBLICATION DAYS

The Index is published on New York Stock Exchange trading days<sup>3</sup>, also referred to as Index Business Days.

## STRESS EVENTS

If CFIX is unavailable due to unforeseen events, the Index will be calculated using the last available CFIX. If CFIX is unavailable for more than three consecutive Index Business Days, escalation to the IOS, as further discussed below, will be made to determine whether to remove the Constituent from the Index. Any such removal will be subject to BOC review, as well as to the transition policies.

## LIMITATIONS OF THE INDEX

The following is a summary of certain limitations associated with the Index but is not meant to be an exhaustive list of all risks and limitations associated with use of the Index. Although the Index is designed to be representative of the markets it measures, it may not be representative of every use case. It is designed and calculated strictly to follow the rules of this methodology, and any Index level or other output is limited in its usefulness to such design and calculation.

- The Cryptocurrency market is open 24 hours, 7 days a week, 365 days a year, while the Index is published for 22 hours on each Index Business Day (only).
- Ambiguity can arise in the determination of Hard Forks for Cryptocurrencies and identification of the primary Cryptocurrency. A determination of which chain is considered primary will be made based on treatment by the Pricing Sources.
- There is inherent, though transparent, judgment in Index construction, as outlined in this methodology. The methodology is also designed for general applicability and not to address the individual needs of Index users. Bloomberg does not advise as to the usefulness of the Index to a particular circumstance, therefore, users are encouraged to seek their own counsel for such matters. The methodology is subject to change, which may impact its usefulness to users. Although efforts will be made to alert users to any material changes in the methodology, not every individual user may be aware of them. Such changes may also significantly impact the usefulness of the Index.
- Cryptocurrencies can be volatile relative to other markets. As the Index is designed to measure these markets, the Index could be materially impacted by market movements, thus significantly impacting the use or usefulness of the information for some or all users.
- Certain Cryptocurrencies are less liquid than others, and even the most liquid markets may suffer periods of illiquidity. Illiquidity can have an impact on the quality or amount of data available to Bloomberg for the calculation, and may cause the Index to produce unpredictable results.

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<sup>3</sup> <https://www.nyse.com/markets/hours-calendars>

- Given the fragmented liquidity across many trading venues, deriving a fair valuation for a Constituent can be challenging, which could lead to unsettling volatility in Index performance. Depending on the liquidity level, trading volume, transaction fees, and other factors, a Cryptocurrency can be traded at different prices across different Pricing Sources making it difficult to know the value of a Cryptocurrency at any given time.
- While Pricing Sources supported by Bloomberg undergo a vetting process, many Pricing Sources have only recently initiated trading and do not have significant trading histories. As a result, the pricing of Cryptocurrencies and the inclusion of such Cryptocurrencies in the Index may be subject to certain risks not presented by regulated stock and commodity exchanges. For example, risks related to the liquidity and price histories.
- Only Cryptocurrencies trading in USD on eligible Pricing Sources are eligible and are subject to inclusion criteria.
- Circulating Supply may be subject to unpredictable change which causes the Cryptocurrency weightings in the index to change.
- BISL may determine to cease publication of the Index. BISL maintains internal policies regarding Index user transitions, but there is no guarantee an adequate alternative is available generally or for a particular use case.

The provisions and procedures set forth in this methodology grant a significant degree of discretion to the Administrator in a number of respects. BISL may exercise this discretion as it determines most appropriate. Furthermore, this methodology does not address all possible issues relating to the Index, related indices or subindices; any omissions or exceptions may be addressed as deemed to be appropriate. In addition, this Index methodology and any other provisions or procedures relating to such indices may be amended at any time.

## **BENCHMARK OVERSIGHT AND GOVERNANCE**

### **Benchmark Governance, Audit and Review Structure**

- The IOS provides direct governance and is responsible for the first line of controls over the creation, design, production and dissemination of benchmark indices, including the Index.
- The oversight function is provided by the BOC. The BOC is independent of the IOS and is responsible for reviewing and challenging the activities carried out by the IOS. In carrying out its oversight duties, the BOC receives reports both from the IOS as well as Legal & Compliance members engaged in second level controls. It also receives and reviews the results of any internal or external audits as a third line of defense.

Periodically (no less than quarterly), the IOS reports to the BOC on governance matters, including, but not limited to, any client complaints, the launch of new benchmarks, cessation of any benchmarks, operational incidents (including errors & restatements) and the results of any advisory councils or other stakeholder engagements. In addition, any governance or control-related issues that arise in the performance of the IOS's duties that are deemed significant, persistent, unable to be resolved and/or worthy of escalation, including issues that may have the potential to incur material risk are escalated to the BOC.

### **Internal and External Reviews**

Index administration is subject to Bloomberg internal compliance function which periodically reviews various aspects of Bloomberg businesses to determine whether such businesses are adhering to applicable firm-wide policies and procedures, and to assess whether applicable internal controls are functioning properly. In addition to the compliance function, Bloomberg may from time to time appoint an independent external auditor with appropriate experience and capability to review adherence to benchmark regulations. The frequency of such external reviews will depend on the size and complexity of the operations and the breadth and depth of the Index use by stakeholders.

## INDEX AND DATA REVIEWS

BISL will review the Index annually to validate whether (a) the design continues to measure the intended markets, (b) the input data used remains sufficient, appropriate and faithful to the data hierarchy, and (c) the selection of Index Cryptocurrencies continues to meet the goal of measuring only liquid and active markets. More frequent reviews may be prompted by extreme market events, such as those described above under "Stress Events". Any resulting material change to the methodology will be reviewed at regularly scheduled IOS and BOC meetings, or during emergency meetings in exigent circumstances, pursuant to their terms of reference.

In determining whether a change to the Index is material, the following factors shall be taken into account:

1. The economic and financial impact of the change
2. Whether the change affects the original purpose of the Index
3. Whether the change is consistent with the overall objective of the Index and the underlying market interest it seeks to measure

BISL will also provide stakeholders notice and engagement regarding the proposed change, the scope and length of which will be informed by the nature of the change and stakeholder impact. During quarterly reviews, or at any time requested by the IOS and/or BOC, these committees will receive all relevant underlying facts and material including Index playbooks, for their review and approval. Membership of these committees is defined under their terms of reference, and procedures for member addition and removal will be strictly followed.

## STAKEHOLDER ENGAGEMENT

BISL is engaged with its users through various channels, including via help desks, sales personnel and direct communication with business personnel. To help ensure the Index remains an accurate representation of the Cryptocurrency markets, BISL endeavors to meaningfully incorporate these engagements into improvements in processes and service. Prior to any material change that might meaningfully impact users, BISL consults more broadly with stakeholders, where appropriate, before a recommendation is presented to the BOC for approval. This concept of shared ownership enables BISL to produce the most relevant indices and helps ensure responsiveness to user needs.

## EXPERT JUDGMENT

BISL may use expert judgment with regards to the following:

1. Index restatements
2. Extraordinary circumstances during a market emergency
3. Pricing or other data interruptions, issues, and closures

When expert judgment is required, BISL undertakes to be consistent in its application, with recourse to written procedures outlined in this methodology and internal procedures manuals. These procedures detail the steps in decision making and the hierarchy of data to be used. Material exercises of expert judgment are reviewed by senior members of the BISL Index and compliance teams. BISL also maintains and enforces a code of ethics to prevent conflicts of interest from inappropriately influencing Index construction, production, and distribution, including the use of expert judgment.

## RESTATEMENT POLICY

BISL makes every effort to provide accurate calculation of its indices. However, to the extent a material error in Index values is uncovered following its publication and dissemination, a notification will be sent to Index clients alerting them of such error and the expected date of a revised publication, if warranted. BISL considers the following factors in determining whether to restate. Not all conditions need to be present to warrant a restatement, and certain factors may be more determinative than others depending on the circumstances of the

given error.

1. The relative importance of the data field impacted by the error
2. When the error occurred and when it was discovered
3. The number of indices impacted
4. Whether the impacted indices are linked to tradable products
5. The magnitude of the error
6. The burden of restatement on client re-processing relative to the impact of the error
7. The impact of the restatement on analytical tools

## **RISKS**

Unlike traditional stock and commodity exchanges, Cryptocurrency Pricing Sources face a number of risks, including but not limited to, distributed denial-of-service ("DDoS"), interruption of trading, hacking of user accounts, lack of standards and naming convention for symbols, and an unstable technological and legal environment (causing changes in fee structure, blocking of funds withdrawal, etc.). Suspension or disruption of market trading in Cryptocurrencies may adversely affect the value of the Index.

## GLOSSARY OF TERMS

Administrator: A benchmark administrator provides indices that are used in financial products and is responsible for all aspects of administration pertaining to the benchmark, including but not limited to, calculation, maintenance, rebalancing, dissemination/distribution and governance.

BGN: BGN refers to Bloomberg Generic price. The BGN is a sophisticated pricing algorithm that produces accurate indications of quotes that are derived from multiple quality sources.

- For a BGN to be computed for a Cryptocurrency, the Cryptocurrency must be priced by at least two approved Pricing Sources
- The BGN algorithm calculates the BGN median bid and median ask prices for the Cryptocurrency
- The BGN mid-price is the average of the BGN bid and BGN ask prices

Data from Pricing Sources are the executable bid and ask prices - not executed trade prices.

Blockchain: Blockchain is a digitized, decentralized, public ledger of all Cryptocurrency transactions.

Bloomberg Index Services Limited or BISL: Index provider and administrator.

Bloomberg: Bloomberg L.P. and its affiliates, including BISL.

BMR/EU BMR: BMR/EU BMR or European Benchmark Regulation is a regulation that came into effect on January 1, 2018, and a regime for Benchmark Administrators to ensure the accuracy and integrity of benchmarks (<https://www.esma.europa.eu/policy-rules/benchmarks>).

BOC: Benchmark Oversight Committee.

CFIX: Bloomberg Crypto Price Fixings or CFIX is designed as a reference point for Cryptocurrencies. It is a simple average of the BGN pricing source for any given Cryptocurrency over a 15 minute window between 11:15:00 ET and 11:30:00 ET. The CFIX generates the simple average of all the BGN ticks within the window for the bid and ask separately; the mid is the arithmetic average of the bid and ask. CFIX will price once a day and publish immediately after the pricing engine has computed the simple average. There may be slight variances in publication times, within seconds, due to a variance in tick volume per currency and the amount of machine time required to compute those. CFIX will publish Monday to Friday when the BGN is pricing and not over weekends.

Circulating Supply: Circulating Supply, or available supply, is the best approximation of the number of coins that are circulating in the market and are available for trade.

Constituent: Cryptocurrency that is a member of the Index.

Cryptocurrency: A Cryptocurrency is a digital asset designed to work as a medium of exchange that uses cryptography to secure its transactions, to control the creation of additional units, and to verify the transfer of assets.

Hard Fork: A hard fork occurs when a Blockchain protocol is radically changed, such that it becomes incompatible with older versions. In effect, participants taking part in transactions on the old Blockchain must upgrade to the new one in order to continue validating transactions in the new Blockchain. However, participants that do not upgrade may continue to support and validate transactions on the old Blockchain protocol separately. The result: a Blockchain splits into two - hence the name "hard fork". If there are nodes permanently supporting the new chain, then the two chains will co-exist. Users that once held digital assets on an older Blockchain before the protocol change at a pre-specified Blockchain length will now also hold an amount of new coins on the altered Blockchain. This new Cryptocurrency has essentially been derived from an older Cryptocurrency as well as its associated Blockchain's transaction history. As per the Index methodology, hard forks are considered to be new Constituents.

Index Business Day: Days on which the Index is published (New York Stock Exchange trading days).

Index Weight: The percent weight of an individual Constituent in the Index. The sum of all Index weights adds to 100%.

IOS: Index Operating Subcommittee.

Liquid: A liquid asset can be converted into cash with minimal impact to the price received in the open market. Liquidity is measured by 30-day median daily value traded in USD.

Market Capitalization: Market capitalization, measured in USD, is calculated as the product of each Cryptocurrency's Circulating Supply and CFIX.

Pricing Sources: Pricing Sources are trading platforms that facilitate buying and selling Cryptocurrencies online. Many Pricing Sources refer to themselves as "exchanges," which can give the misimpression that they are regulated or meet regulatory standards of a national securities exchange. Many of the U.S.-based digital Cryptocurrency trading platforms have elected to be state-regulated "money-transmission services". Traditionally, from an oversight perspective, these predominantly state-regulated payment services have not been subject to direct oversight by the SEC or the CFTC.

Rebalance Announcement Day: Four Index Business Days prior to the end of every month wherein Constituents that will represent the Index in the following month are determined and announced.

Rebalance Implementation Day: First Index Business Day of every month wherein the results announced on the Rebalance Announcement Day are implemented.

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